Superhydrophobic textures for micro- and nanofluidics

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Superhydrophobic surfaces reduce drag by combining hydrophobicity and roughness to trap gas bubbles in a microscopic texture. At the microscopic scale, superhydrophobic surfaces could revolutionize microfluidic lab-on-a-chip systems, which are becoming widely used in biotechnology. We discuss how the wettability and roughness of a solid impacts its hydrodynamic properties. We see in particular that hydrophobic slippage can be dramatically affected by the presence of roughness. Owing to the development of refined methods for setting very well controlled micro- or nanotextures on a solid, these effects are being exploited to induce novel hydrodynamic properties, such as giant interfacial slip, superfluidity, mixing and low hydrodynamic drag, that could not be achieved without roughness. Promising directions for further research are also discussed.

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